

An Examination of Upper ocean Processes in the Greenland Sea Utilizing Archived Fluxes, Satellite-Derived Ice Data, and a 1-D Upper ocean Model

F. Carsey, (California Institute of Technology Jet Propulsion Laboratory, Pasadena CA 91109, USA)

R. Garwood, (Naval Postgraduate School, Monterey CA 93943, USA)

The Greenland Sea is characterized by deep and intermediate winter convection and an ice cover with a complex seasonal cycle. While the ice extent variations may or may not be related to the convection, the brine flux from ice growth plus that obtained from the intermediate levels by entrainment are crucial to the preconditioning of the upper ocean density such that the water can sink. One can demonstrate simply that both sources of brine are required; to summarize, the net salt flux from entrainment is greater, but the flux from ice growth is essential when the upper salinity is close to the intermediate value as the entrainment salivation efficiency (for reasonable surface fluxes) vanishes. This can be demonstrated with a simple model that partitions heat loss into ice growth or entrainment.

To more fully understand the preconditioning processes, we chose to model the mixed layer under Greenland Sea conditions. This was approached by utilizing a 1-D model which accounts for mechanical mixing due to air stress, surface fluxes, diffusive instabilities at the mixed-layer base, and entrainment from mixed-layer deepening. The model is initialized by using Greenland Sea Project fall profiles of temperature and salinity, and driven by ECMWF surface fluxes of heat and momentum. When the surface water has a (thermobarically) unstable density, the ice formation is assumed to cease. The performance of the model is verified by comparing the predicted and observed ice extents. The initial results of this program are as one would expect, ice forms where the surface waters are fresher in the fall and persists where the fall upper salinity is very low or the intermediate water is sufficiently cool.

The rate of entrainment is the key to the modeling and, possibly, to the actual onset of convection as the mixed layer typically grows from 10s to 100s, or more, meters depth during preconditioning. Clearly, a change in intermediate T-S character will alter the march to convection.

First Author & Presenter: **Dr. Frank Carsey**, Ph# 181 8354 8163;
Fax# 1818393 6720; Internet: fdc@pacific.jpl.nasa.gov

Mailing Addresses:

Dr. Frank Carsey, JPL ms 300-323, 4800 Oak Grove Dr., Pasadena CA 91109, USA
Dr. Roland Garwood, Code OC/Gd, Naval Postgraduate School, Monterey CA 93943, USA; Ph# 408656 3260; Internet: garwood@oc.nps.navy.mil

Symposium: **IAPSO XXI** General Assembly, PS-07 Air-Sea-Ice interactions and High Latitude Ocean Processes, M. Leppäranta, Convenor
Oral Presentation Preferred

Extra Equipment: None